Extreme Temperature Stitched Structures, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

The innovation proposed here is the development of an integrally stiffened stitched composite structure that is capable of operating within extreme thermal environments similar to those encountered by atmospheric reentry vehicles. Such temperature extremes and challenging structural weight goals will necessitate the use of advanced composite material systems that can also be assimilated into structurally efficient hot structure architectures that are damage tolerant, lightweight, and reasonably affordable to manufacture. While such goals have been achieved within subsonic design regimes using the Pultruded Rod Stitched Efficient Unitized Structure (PRSEUS), the lack of elevated temperature capable materials has precluded its application at higher temperatures. Recognizing the potential that this novel structural design approach might hold at higher temperatures, coupled with the recent advances made in carbon fiber sewing threads, further experimentation is warranted to determine whether the advantages demonstrated using integral stitched structures could also be extended to high speed airframe applications.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: Innovative material and structural concepts that provide reductions in mass and volume for next generation space vehicles shows up as a key focus area in nearly all NASA and Air Force technology roadmaps for futuristic high speed airframes.

To the commercial space industry:

Potential Non-NASA Commercial Applications: Aggressive competition among the big three jet engine manufacturers has led to several advanced applications of composite hot structures in next generation commercial aircraft engines. Such swift implementation virtually guarantees that subsequent improvements will follow, and that larger and more integrated

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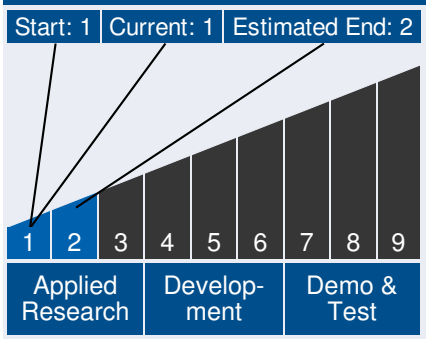
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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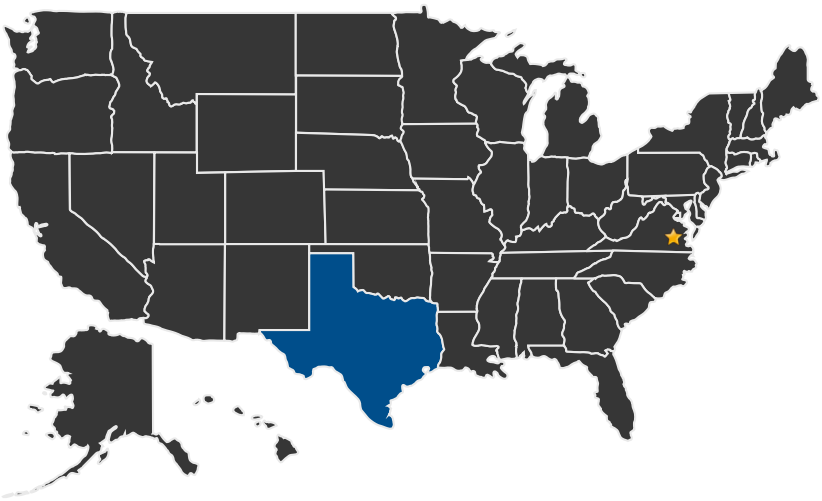
structural components will be designed that can benefit from the integrated structural approach proposed in this STTR.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Carbon-Carbon Advanced Technologies, Inc. (Kennedale, TX)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23335)

Management Team *(cont.)*

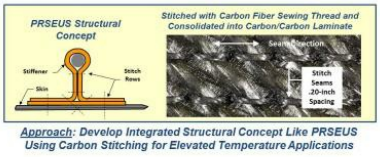
Principal Investigator:

- Aaron Brown

Technology Areas

Primary Technology Area:
Materials, Structures, Mechanical Systems and Manufacturing (TA 12)
└ Materials (TA 12.1)
  └ Lightweight Structural Materials (TA 12.1.1)

IMAGE GALLERY



Extreme Temperature Stitched Structures, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

Extreme Temperature Stitched Structures, Phase I

Potential Applications

Innovative material and structural concepts that provide reductions in mass and volume for next generation space vehicles shows up as a key focus area in nearly all NASA and Air Force technology roadmaps for futuristic high speed airframes.